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S. HRG. 103-89

**HEALTH RISKS ASSOCIATED WITH EXPOSURE  
TO GASOLINE ADDITIVES—METHYL TERTIARY  
BUTYL ETHER [MTBE]**

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**HEARING**  
BEFORE A  
SUBCOMMITTEE OF THE  
COMMITTEE ON APPROPRIATIONS  
UNITED STATES SENATE  
ONE HUNDRED THIRD CONGRESS  
FIRST SESSION  
**SPECIAL HEARING**

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Printed for the use of the Committee on Appropriations



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# HEALTH RISKS ASSOCIATED WITH EXPOSURE TO GASOLINE ADDITIVES—METHYL TER- TIARY BUTYL ETHER [MTBE]

WEDNESDAY, MARCH 10, 1993

U.S. SENATE,  
SUBCOMMITTEE ON LABOR, HEALTH AND HUMAN  
SERVICES, AND EDUCATION, AND RELATED AGENCIES,  
COMMITTEE ON APPROPRIATIONS,  
*Washington, DC.*

The subcommittee met at 10 a.m., in room SD-192, Dirksen Sen-  
ate Office Building, Hon. Tom Harkin (chairman) presiding.  
Present: Senators Harkin, Bumpers, and Stevens.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

CENTERS FOR DISEASE CONTROL AND PREVENTION

STATEMENT OF DR. WILLIAM L. ROPER, DIRECTOR

ACCOMPANIED BY:

DR. RUTH ETZEL, CHIEF, AIR POLLUTION AND RESPIRATORY  
HEALTH BRANCH

DR. RON MOOLENAAR, EPIDEMIC INTELLIGENCE SERVICE OFFI-  
CER

OPENING REMARKS OF SENATOR HARKIN

Senator HARKIN. The Senate Subcommittee for Labor, Health, and Human Services, and Education, and Related Agencies will come to order.

Good morning. This subcommittee is having a hearing this morning on a study recently done by the Centers for Disease Control in the State of Alaska. I want to express my appreciation to Dr. William Roper, Director of the Centers for Disease Control and Prevention in Atlanta, who has taken time out of his busy schedule to be here this morning.

We are here today to examine concerns about possible health risks associated with exposure to the gasoline additive known as MTBE, which stands for methyl tertiary butyl ether.

The reason I asked Dr. Roper to be here this morning is because a preliminary report, by the CDC, recently found that high exposure to MTBE may cause, and I quote, "headaches, eye irritation, burning of the nose or throat, nausea, vomiting, dizziness, cough, and disorientation."

Dr. Roper will fill in the details, but let me start by giving a little background.



The increased use of MTBE as a fuel additive began with the 1990 Clean Air Act. The Clean Air Act designated 39 cities as having excessive levels of carbon monoxide. To reduce carbon monoxide, beginning last winter, these cities were ordered to add an oxygenate to their gasoline during the winter months. One of the cities in which MTBE was used as an oxygenate was Fairbanks, AK.

Shortly thereafter, hundreds of people in Fairbanks reported symptoms such as headaches and nausea while driving or refueling their cars. At the request of the Alaska Department of Health and Social Services, the Centers for Disease Control and Prevention assisted the State in investigating whether or not the numerous health complaints were related to the use of MTBE.

Since that time, similar consumer complaints have surfaced in Missoula, MT, and parts of Colorado and New Jersey. There is a real concern that while MTBE is supposed to be cleaning the air, it may also be polluting people's bodies. And we have got to get to the bottom of it.

I called this hearing today because this subcommittee oversees the Centers for Disease Control, and in that capacity I believe we have a responsibility to identify the problem if it does exist, and if it does exist, then to act in hopes of preventing further illnesses from occurring.

Dr. Roper, you know how strongly I feel about prevention. As chairman of this subcommittee I have made prevention one of my causes, and in fact, one of my bills changed the name of the Centers for Disease Control to the Centers for Disease Control and Prevention, for which you were most helpful and for which I am very appreciative. I think you would agree that if a problem with MTBE does exist—and I say that if a problem with MTBE does exist—we should deal with it now to prevent the pain and suffering of further illnesses.

I look forward to hearing your findings on this matter. Let me now recognize the ranking member of the full Appropriations Committee and member of this subcommittee, my friend, the Senator from Alaska, Senator Stevens.

#### STATEMENT OF SENATOR TED STEVENS

Senator STEVENS. Thank you very much, Mr. Chairman. I am pleased you have called this hearing. It is nearly 3 years ago, on April 2, 1990, that the Senate accepted my amendment to allow the Administrator to waive the so-called oxygenated fuel requirements for carbon monoxide nonattainment areas in Alaska. That was during debate on the clean air bill.

At that time, there were concerns raised by Alaskans, particularly by the University of Alaska, that these fuels, intended to be cleaner burning, would not work in ultracold climates like Alaska, and that the health risks from such fuels were unknown. Despite those concerns, my amendment, as you know, was dropped in the conference committee on the clean air bill.

In Alaska, oxygenated fuels are made by mixing gasoline with this chemical known as MTBE. No real studies had been done by 1990 on the effects of this oxygenated fuel on human health in cold climates such as our State. The oxygenate requirements went into



effect in the fall of 1992 in Alaska, and as soon as MTBE reached the pumps in Fairbanks complaints started rolling in, and literally, my phone came off the hook.

Hundreds of Alaskans who came in contact with MTBE fuel reported symptoms, as you have indicated, ranging from headaches daily, severe difficulty in breathing while fueling cars, skin rashes, shortness of breath, dizziness, burning of eyes, numbness of tissue, swollen tissue, and congestion, all of the symptoms that people felt were associated with breathing or touching the MTBE fuel.

We, in the Alaska delegation, appealed to Administrator Riley to exercise maximum flexibility and suspend these oxyfuel programs in Alaska and work with the Governor on solutions to the problem. That was not possible, they felt, under the law. They did not have the discretion to do that, and in mid-December our Governor, Wally Hickel, announced that he suspended the oxygenated fuels program in Alaska, under our State authority, pending further tests of the effect of this fuel when burned in cold climates.

Shortly after the preliminary reports quantified some of the health effects thought to be related to MTBE oxygenated fuels in Fairbanks, MTBE was found in blood samples of Alaskan residents. Since the Governor's suspension, the EPA, in consultation with our Governor's office and CDC, put together a testing program to start answering questions about how these oxygenated fuels affect human health.

We have had some breathing room, literally now, since the fuels program is not scheduled to be reinstated until next October, and we want to try to do everything possible to make sure we know for sure what the health effects of MTBE fuels are before the program is reinstated in Fairbanks.

The State used its powers to protect the health of our people in regard to the suspension. I have got to tell you, however, that it is not just Fairbanks. Anchorage residents have now contacted me, disturbed over this issue as well, and they have now formed a group which has over 17,000 members. These Anchorage residents signed a petition demanding that these oxygenated fuels with MTBE not be used in that area either. Both areas are nonattainment areas under the Clean Air Act.

Dr. Roper, as your work to determine the health effects of the fuels continues, I want you to know we very much support that effort. It is my intention to put in a bill, or try to seek an amendment to legislation that will once again give the administrator the authority to suspend the use of these fuels in Alaska, particularly in our extreme cold areas, until they are proven to be safe.

I think the problem is that we really do not know the health effects and we do not know the long-term effects on body functions, and we are very concerned that there be a full study before this use goes into full effect. I hope we will be able to ask you some questions, Doctor.

Mr. Chairman, Alaskans are sincerely grateful to you for this hearing and they feel that finally someone is listening. So you have our full support, and I congratulate you on calling this hearing and want to work with you on it.

Senator HARKIN. Thank you very much, Senator Stevens.

Dr. Roper, again, welcome to the subcommittee. I want to express my appreciation to you for all of the fine leadership you have given to the Centers for Disease Control and Prevention over the years. I say publicly I think you have done an outstanding job in leading that agency. In terms of public health I believe it is one of the jewels in our crown, here in the United States. So again, welcome. Your statement will be made a part of the record. Please proceed.

#### OPENING STATEMENT OF DR. WILLIAM ROPER

Dr. ROPER. Good morning, sir. Senator Stevens, it is a pleasure to be with you. Thank you for that kind introduction.

What I will do is abbreviate my statement and summarize it now, if I could. As you said in your introduction, we are now proudly, not only CDC but the Centers for Disease Control and Prevention. I well remember sitting at this table 2 years ago when you asked my thoughts on your proposal to add the word prevention to our title, and I think I told you that I was open to the idea and moving toward enthusiastic. And now 2 years later, it having been accomplished last fall by your bill, we are wildly enthusiastic. This is a move that the people at CDC and across the public health community have accepted as a very positive step, and we are delighted to be able to continue using our initials CDC, but thank you for making us official the Nation's prevention agency.

I want to again thank you for the opportunity to appear today and to provide information on the investigation that you have alluded to in your introduction. In December of last year, at the request of the State of Alaska, CDC assisted the State in investigating health complaints related to exposure to oxygenated fuels containing methyl tertiary butyl ether, or MTBE as we are referring to it, in Fairbanks, AK.

Dr. Ronald Moolenaar and Dr. Brockton Hefflin from CDC conducted the investigation in Fairbanks, and they were assisted by Dr. Ruth Etzel of our National Center for Environmental Health through consultation from Atlanta. Dr. Moolenaar and Dr. Etzel are with me this morning.

The purpose of the investigation was to identify and characterize acute health complaints with a questionnaire survey and to measure environmental exposure and blood levels of MTBE.

Lab analysis of blood samples collected in Fairbanks was performed in our environmental health lab. The accurate analysis of the blood samples was especially crucial to this investigation. Our environmental lab is able to measure many volatile organic compounds in the blood at the level of parts per trillion.

As you know, the Clean Air Act amendments of 1990 stipulated that by November 1 of last year the 39 regions which exceeded the National Ambient Air Quality Standard for carbon monoxide, or the CO nonattainment areas as they are known, were required to use oxygenated fuels containing no less than 2.7 percent oxygen by weight. Oxyfuels contain an additive such as ethanol or MTBE which increases the oxygen content of the fuel in order to produce more complete combustion and reduce carbon monoxide emissions.

Fairbanks is a nonattainment area for carbon monoxide. That is, at times Fairbanks exceeds the maximum levels of carbon mon-

oxide set by the EPA. Accordingly, the city began converting to the use of oxygenated fuel containing 15 percent by volume MTBE in mid-October of last year. The level by which Fairbanks has exceeded the CO standard does not normally result in measurable adverse health effects in healthy adults.

Within the first 3 weeks of November over 150 people reported symptoms to a hotline that a citizen there had established. These symptoms included headache, dizziness, and nausea. During this period, the media was giving much attention to the subsequent oxyfuel controversy. And as you have said, subsequently the Governor requested assistance from CDC to help determine the possible relationship between reported health complaints and oxygenated fuels in Fairbanks.

CDC proposed two goals for the first phase of the investigation: first, to document exposure to MTBE by measuring it and its metabolite tertiary butyl alcohol in blood; and, second, to determine the possible relationship between exposure to MTBE and the reported health complaints.

In December, two CDC epidemiologists recruited 18 nonsmoking persons in Fairbanks who were routinely exposed to motor vehicle exhaust and/or gas fumes in the workplace. Eight of those workers spent most of their workday in vehicles—for example, a garbage collector, someone who drove an animal control vehicle—the remaining 10 workers were stationary at their worksites—gas station attendants and so on. Blood samples were drawn during December at the various worksites before and after a typical 8- to 10-hour work shift.

To assess the possible changes in blood levels of MTBE associated with a typical commute to work in Fairbanks, blood samples were drawn from seven additional people before going to work in the morning and again upon travel at the workplace. To measure environmental levels of the MTBE over an 8-hour period, the Alaska Department of Environmental Conservation placed an evacuated canister—that is, a device used to make environmental measurements—in the room or vehicle in which each worker spent the majority of his or her time during the work shift.

Questionnaires were administered to the workers the same day that biologic and environmental sampling was performed for each worker. The questionnaire assessed personal characteristics such as age and sex, health complaints, motor vehicle use, and working conditions.

Some 15 of the 18 workers studied reported new onset of at least one health complaint since October 14, 1992, the date when oxygenated fuels were first introduced, and these symptoms were unrelated to a cold or the flu. The health complaints included headache, eye irritation, burning of the nose or throat, nausea or vomiting, dizziness, cough, or a sensation of spaciness or disorientation.

Our environmental health lab found measurable amounts of MTBE and its metabolite in each of the pre- and postshift blood samples of the 18 workers. The average postshift blood MTBE concentration was statistically significantly higher than the average preshift blood MTBE concentration. The difference between the pre- and postshift concentrations correlated strongly with air MTBE concentrations.



The only statistically significant predictor for the difference between pre- and postshift concentrations was the concentration of MTBE in the workplace air. Other variables such as the age of the worker, the type of vehicle driven, the year of the vehicle driven, the amount of time spent in a vehicle, were not significantly predictors.

Postshift blood MTBE concentrations and the difference between pre- and postshift concentrations were separately ranked from highest to lowest values. The individuals with blood concentrations at the highest one-quarter in each case were more likely to have had health complaints the day of the sampling than those with concentrations in the lower three-quarters. These differences, however, were not statistically significant.

The average postcommute blood MTBE concentration was statistically significantly higher than the average precommute blood MTBE concentration for the seven commuters.

As you have said, in mid-December Governor Hickel suspended the oxyfuel program in Fairbanks, and gasoline without MTBE began to flow in December, late December.

In February—that is, last month—the two CDC epidemiologists returned to Fairbanks to continue the investigation in the absence of oxyfuels. This time they recruited 43 persons occupationally exposed to motor vehicle exhaust or fumes. As before, they drew pre- and postshift blood samples on each worker, administered a questionnaire, and coordinated environmental sampling.

In addition, an industrial hygienist from CDC's National Institute for Occupational Safety and Health obtained personal air samples from the immediate breathing environment of each worker. All lab analyses for this phase of the investigation are currently in progress.

Let me summarize.

To date, we can conclude that MTBE is measurable in the blood of workers and commuters who are exposed to motor vehicle exhaust and/or gasoline fumes containing MTBE. In addition, blood MTBE concentrations correlate strongly with environmental exposure to MTBE. The results of the first phase of the investigation in Fairbanks, which are based on 18 workers, suggest a possible relationship between blood MTBE concentration and health complaints. At this point, because of the preliminary nature of these results, we strongly recommend further investigation to understand better the relationship between environmental exposure to MTBE and health complaints.

That ends my statement. I would be happy to answer your questions.

Senator HARKIN. Doctor Roper, thank you very much for a very straightforward recital of the conditions and the findings that you at CDC determined in your sampling in Alaska. I just have a few questions, and then I will turn to Senator Stevens for his questions.

Doctor Roper, you mentioned in your statement that MTBE concentrations were picked up in the blood. Is my understanding correct that this is the first time anyone has tried to measure the blood for MTBE?

Dr. ROPER. That is my understanding, yes, sir. Our environmental health lab is at state of the art, and as I said in my statement, we can measure at parts per trillion. So we are talking about very minute amounts. This is the first time for measuring blood MTBE after environmental exposure. Blood MTBE measurements have been made after clinical use of MTBE to dissolve gallstones.

Senator HARKIN. How did blood MTBE concentrations for workers exposed to gasoline compare with blood MTBE concentrations for commuters in Fairbanks? I mean, how did the workers compare to the commuters in their concentrations?

Dr. ROPER. The workers had higher concentrations than the commuters.

Senator HARKIN. Do you know how much higher? Was it significantly higher?

Dr. ROPER. Significantly higher on the order of 10 times as much.

Senator HARKIN. For the workers?

Dr. ROPER. Yes, sir; higher for the workers than the commuters.

Senator HARKIN. And this would be the workers that would be working outside?

Dr. ROPER. We are talking about people pumping gas in a service station or someone who spent all of his or her day in a vehicle, in other words, who had more prolonged exposure than someone who spent one-half hour driving to work. Some workers, such as auto mechanics, spent time mainly indoors.

Senator HARKIN. Did you find a relationship between blood MTBE concentrations and health complaints for the workers?

Dr. ROPER. Yes, sir; there appeared to be a link there, but that is something that obviously deserves much more careful study. What we did is look at the concentration before the shift and after the shift and found those people that had the most increase in blood concentration over that time period, and the people who had the most increase were the ones most likely to have reports of these health complaints that I mentioned.

I might just add one thing I did not say in my statement. We measured MTBE in our doctors who did the investigation. We did blood samples in Atlanta and then we did blood samples once they got up to Fairbanks. And they did not have the chemical in Atlanta, they did have it when they got to Fairbanks. So the question is obvious, and that is people who are around gasoline that contains this fuel pick it up. What happens after that and what the health effects are is what everybody is interested in determining. And we are surely anxious to do further studies.

Senator HARKIN. So your doctors took their own blood samples?

Dr. ROPER. Yes, sir; on each other.

Senator HARKIN. On each other?

Dr. ROPER. Yes, sir.

Senator HARKIN. Before they went to Alaska, and then while they were there, and when they came back? Is that what you did?

Dr. ROPER. Yes, sir; and within 16 hours of being back in Atlanta there were no detectible levels of MTBE.

Senator HARKIN. How exposed were they to MTBE?

Dr. ROPER. They were driving vehicles in the city of Fairbanks.

Senator HARKIN. That would mean almost everyone in Fairbanks would have some in their blood, would it not?

Dr. ROPER. Yes.

Senator HARKIN. Not just the workers or the cab drivers.

Dr. ROPER. Well the point that they were trying to look at and that I think your question gets to is, does more prolonged exposure, does closer exposure yield higher blood levels. The answer to that is yes. And again the question is, where on that spectrum do you cross over the line from simply minute, but barely detectable levels in the blood to something that might cause health problems. And we simply do not know the answer to that yet.

Senator HARKIN. Your doctors that took their blood samples, I assume since they were minutely exposed they did not have any health problems?

Dr. ROPER. No, sir; they did not.

Senator HARKIN. I guess the two doctors that participated here are Dr. Etzel and—

Dr. ROPER. Dr. Moolenaar is here with me. He is one of the ones that went to Fairbanks. Dr. Etzel is here. She stayed back in Atlanta and supervised them long distance.

Senator HARKIN. Do your doctors always act as guinea pigs themselves?

Dr. ROPER. It is easier to get our consent than other people's.

Senator HARKIN. That is interesting, and pretty brave. I guess the next question that I want to ask you is do we know what the toxicity of MTBE is in the blood?

Dr. ROPER. I think there have been some careful studies done of significantly higher levels; much, much higher levels of MTBE administered to laboratory animals. But we do not have adequate information about this low level exposure in humans. I think everybody would agree that that is something that deserves further study.

Senator HARKIN. Governor Hickel, as Senator Stevens says, suspended the MTBE oxygenate fuel program in December. Did you return to Fairbanks after the MTBE was removed from gasoline?

Dr. ROPER. Yes, sir; CDC sent Dr. Moolenaar and Dr. Hefflin back in February and they have done some followup sampling. Our lab is still running those samples, so I do not have those results for you today, but yes, we are doing the followup there.

Senator HARKIN. Did you find any decrease in reported acute health symptoms?

Dr. ROPER. Yes, sir; the complaints have significantly diminished.

Senator HARKIN. Can you tell us which symptoms decreased after MTBE was removed?

Dr. ROPER. They have all decreased. All seven mentioned earlier, headache, eye irritation, burning of the nose or throat, nausea or vomiting, cough, dizziness, and a sensation of spaciness or disorientation decreased.

Senator HARKIN. All of the symptoms?

Dr. ROPER. Yes, sir.

Senator HARKIN. Do you recommend that the use of MTBE be restricted to lower levels, say 2 percent to 11 percent of previous octane programs?

Dr. ROPER. We defer to our colleagues at EPA on those judgments. Clearly, the Nation would benefit from diminished levels of



carbon monoxide in the air, and we believe as environmental health scientists that the Nation has a stake in doing that. But how to achieve that end is the Environmental Protection Agency's business.

Senator HARKIN. I guess from your testimony you are just saying that basically we need some more investigation into this.

Dr. ROPER. Yes, sir; and we are working with EPA to design and undertake those kinds of studies.

Senator HARKIN. I understand that studies of the chronic effects of MTBE were started in 1987-88, at the same time that the Environmental Protection Agency granted oil companies permission to increase MTBE levels from 11 percent, the maximum previously allowed, up to 15 percent.

Did CDC or any other public health agency begin studies of acute health effects at the same time?

Dr. ROPER. No, sir; we have not done those and those, again, are studies that we need to do.

Senator HARKIN. So my following question, then, is should we?

Dr. ROPER. Sure. Yes, sir.

Senator HARKIN. My last question is basically this. MTBE is listed as one of the 189 hazardous air pollutants under the Clean Air Act amendments. Yet, MTBE was approved as an oxygenate at 15 percent by volume.

If it is determined that there are acute health effects, what then is the relationship between CDC and EPA in ensuring the MTBE use is limited to protect public health?

Dr. ROPER. Well, as I said in my earlier answer, it is the decision of the Administrator of EPA whether to include chemicals like MTBE in formulated gasoline. Whatever we discover from our studies we will pass on publicly but also officially to EPA, and hope that they will take account for that, and I am sure they will.

I just might add that the further studies that I keep alluding to, among them we think are studies done in the lower 48 States. Senator Stevens in his statement suggested the possibility that has surely occurred to us and everybody else. That is, is there something unique about the climate in Alaska that causes this situation to result.

And while we do not have a judgment on that, we believe the same type of study that we have done in Fairbanks needs to be done in a city in the lower 48 which has MTBE introduced, and then another city as a control that does not have MTBE, so we can fully evaluate all of the possibilities here.

Senator HARKIN. So, whatever studies you do you will make available to EPA?

Dr. ROPER. Oh, yes sir.

Senator HARKIN. Thank you very much, Doctor Roper. Senator Stevens.

Senator STEVENS. Thank you, Mr. Chairman. You know, doctor, we faced this in Alaska because Anchorage and Fairbanks experience an average nonattainment of Clean Air Act standards of 4 to 6 days a year because of carbon monoxide concentrations. Particularly in Fairbanks it is caused, I think, by ice fog that just sort of forms a blanket over the area, and contains the emissions from all engines, whether they are automobiles or home furnaces. But, I be-



lieve that occurs in Fairbanks about 2 to 3 days a year, and in Anchorage, 4 to 6 days a year.

Now, I want to ask you a little bit about that, if you have the information. The carbon monoxide periods are not normally consecutive. They happen two to three times annually in Fairbanks, four to six times in the State as a whole, primarily in Anchorage otherwise.

Do you have any studies or any background on the carbon monoxide impacts on the human being in cold weather areas.

Dr. ROPER. I do not think we have studies done in cold climates contrasted with warmer climates. But, again, that is the sort of comparison study that does need to be done.

Senator STEVENS. I am interested in whether the prevention, in this case, of the effects of oxygenated fuels in extremely cold temperatures that are subject periodically to the carbon monoxide non-attainment, is worse than the natural condition. That is why we sought the exemption in the first place, since we have so few days involved, and we get involved in this I think, what, from October through March in order to deal with 2 to 3 days in Fairbanks and 4 to 6 days in Anchorage. It seems like the prevention is worse than the problem we are trying to deal with in Alaska.

Dr. ROPER. Well, your point really is part of a larger question. That is, we do not want bad things to happen to anybody, but we have got to be careful that when we intervene we do not cause a worse problem than the one that was there to begin with. And that is true across the board. It is surely true in environmental health in particular.

Senator STEVENS. Our nonattainment times include periods of very, very low temperatures. My first home was in Fairbanks. I can tell you, I have seen it 68 below. I saw it this January 45 to 50 below. And it is in those periods that we have this problem. The period of the worst complaints were in December and January.

Is it possible to get a test measuring the effects of MTBE in cold weather, extremely cold weather areas, as compared to those of normal and maybe those in the higher temperatures, such as Los Angeles? They have a similar problem, as I understand it, caused by smog. But it is persistent there, rather than periodic and associated just with the temperature variance, as it is in Alaska.

Dr. ROPER. My short answer to your question is yes, it is possible to do that. Just to elaborate, we would like to do that—observe what happens through the cold period in Fairbanks or a similar city, and then compare that to what happens in a warmer city. And then also, as a control, a city that does not have MTBE present at all.

One of the complications of this is even in Alaska it is getting warmer, I trust, and so we have measured what we have measured this winter. It remains to be seen whether we can fully accomplish all of these studies this spring in the other areas, or whether we will have to wait for the winter of 1993–94 in order to do the study.

Senator STEVENS. We would just as soon you did them somewhere else and bring the results back to Alaska, and not have another winter of MTBE in Alaska, but I understand what you are saying.

Going back to the questions the chairman asked you, though, do we have any indication at all what happens to the body when MTBE enters the bloodstream?

Dr. ROPER. I think we have a general understanding of what happens at the chemical level. That is, the breakdown of MTBE to tertiary butyl alcohol, and so on. And we have got some general information from laboratory studies about the health effects, again at very, very, very much higher levels. What we do not have is what happens at these relatively minute levels of exposure, and that needs to be done again, of course.

Senator STEVENS. Are you performing studies now, other than the one that is related to Alaska, on the effects of MTBE on the body?

Dr. ROPER. What we are doing is, again in concert with the Environmental Protection Agency, preparing to do a followup study in Alaska, and in the two other cities in the lower 48 that I have described for you. Those are the studies we planned.

Senator STEVENS. Now, it was my understanding from my staff that the levels of 2 percent to 11 percent of MTBE were used in other States. In our State, we had only the 15 percent. Did you know that?

Dr. ROPER. Yes, sir; the MTBE has been used for some time as an octane enhancer of gasoline at those lower levels. It is at the 15 percent that it is used to try to diminish the output of carbon monoxide. But it has been used in other countries and at lower levels as an alternative to lead in gasoline as a boost to the octane level.

Senator STEVENS. Do you know if any of the tests that you ran in Fairbanks occurred at the time of the extreme low temperatures, when there is nonattainment under the Clean Air Act? We did have a few days in December that were nonattainment.

Dr. ROPER. Just prior to the followup study, that is, during the time when MTBE was not there, there was one of those very cold periods but not during the period of the presence of the MTBE. There were two nonattainment days during February, but temperatures were not cold, and MTBE was not in use.

Senator STEVENS. I see. We were wondering whether the combination of the effects of the carbon monoxide coming from the nonattainment and MTBE would accelerate the impact of the MTBE in the body. Do you know?

Dr. ROPER. Again, we do not know the answer to that, but that is a very obvious question. If these problems appear to have happened in Alaska and not in other locations, the average layperson would ask is it the cold weather, and that needs to be looked at.

Senator STEVENS. But they have also asked me if in the periods that we do have the problem from the carbon monoxide, would having MTBE added to that problem accelerate the problem, the impact of MTBE in the body?

Dr. ROPER. I do understand your question, sir, but I just do not have an answer for you.

Senator STEVENS. Again, we are grateful to you for your assistance, and my State government has asked me to thank you personally, and those you sent to Alaska for their understanding and their assistance. This is not a group of complainers. When you can

live at 45 below and 50 degrees below and carry on your normal lifestyle, people are not normally complainers. But this time, this one really hit us hard.

Senator BUMPERS. They sent all of them to the Senate. [Laughter.]

Senator STEVENS. Some of us get vacations from that, that is true. But you can come back with me. I took the Postmaster General to Alaska when the digital thermometer read minus 99 °C in terms of windchill factor, Senator. So, we would be happy to show you some cold weather if you want to see it. That was further up. That was up at Point Barrow.

We sincerely appreciate your efforts and we are grateful to you, Mr. Chairman.

Senator HARKIN. Thank you very much, Senator Stevens. I just want you to know, also, that I recently wrote a letter to Ms. Browner, the head of EPA, asking that they contract with the CDC to do these further studies. There is obviously a funding problem here, but I think it is something that we ought to get to the bottom of. And I would like to ask for your support in trying to get the EPA to contract with CDC to do the study. I think CDC is the proper agency to do these studies to find out what the health effects are and to compare these studies, as you said, between Alaska and the lower 48.

Senator STEVENS. I still maintain, Mr. Chairman, that our deviation from the Clean Air standards are so minimal, 4 to 6 days total, and 2 to 3 days a year in this vicinity, that we ought to be exempt. We just do not see any reason to have oxygenated fuels added to the carbon monoxide problem. Thank you.

Senator HARKIN. Thank you, Senator Stevens. Senator Bumpers.

Senator BUMPERS. Thank you, Mr. Chairman. Dr. Roper, has this additive been used for other purposes in the past, other than increased octane?

Dr. ROPER. Yes, sir; it is used in medical circumstances as a means of dissolving gallstones. It is infused at high concentration into gallbladders and it dissolves the gallstones.

Senator BUMPERS. You tell me it is actually injected into the gallbladder to dissolve gallstones?

Dr. ROPER. Yes, sir.

Senator BUMPERS. And you have never had these complaints from it?

Dr. ROPER. Occasionally there have been some complaints by patients complaining of not liking the odor of the MTBE that they sense when they are receiving it, nausea, vomiting, sedation, that sort of thing.

Senator BUMPERS. Were the patients who were using this, where doctors use this to dissolve gallstones—did any of the patients have the same kinds of symptoms or aftereffect that these people have had?

Dr. ROPER. Similar kinds of things, as I was saying. Complain about the odor, nausea, sedation, and so on.

Senator BUMPERS. Headache?

Dr. ROPER. Not specifically.

Senator BUMPERS. Nausea?



Dr. ROPER. Yes; but again, they were undergoing a procedure on their gallbladder.

Senator BUMPERS. How long has this chemical been around?

Dr. ROPER. At least 10 years, I am not sure, but it is a chemical that has been used as an octane enhancer for some time.

Senator BUMPERS. Have we always known that it would have the effect of reducing carbon monoxide emissions?

Dr. ROPER. I think it has been a theoretical—it is a thing that the engineers and chemists have known, but it came to the fore, as you know, when the Congress debated the Clean Air Act as a strategy for reducing carbon monoxide emissions, and is a major part of the Clean Air Act of 1990. That is, the introduction of oxyfuels in those areas of the country that have a carbon monoxide problem.

Senator BUMPERS. Under the big chemical bill we passed here several years ago, would it be mandatory or required for this chemical to be tested and approved before it could continue to be used, or has it ever been licensed or tested?

We have the National Center for Toxicological Research in my State. Is that the sort of thing they would do studies on?

Dr. ROPER. Yes, sir; and I believe they have done some of those studies. But this whole matter that I am relating to this morning suggests that further studies of that sort ought to be done. The studies to date have been largely very, very high concentrations of the chemical being introduced in laboratory animals.

Senator BUMPERS. What is the difference in the level of use, that is, the quantity? What is the difference in the quantity used in the past for the purposes of adding octane and the quantity being used to reduce carbon monoxide emissions?

Dr. ROPER. The level of its introduction for the control of carbon monoxide is up to 15 percent by volume, and as an octane enhancer it is 2 to 3 percent, something like that.

Senator BUMPERS. And you never had any complaints until they started using considerably greater quantities for this purpose?

Dr. ROPER. We are not aware of them, no sir.

Senator BUMPERS. Now, do other refineries around the country put this additive in?

Dr. ROPER. Do you mean is it put in and used in other cities?

Senator BUMPERS. Yes; is this being used nationwide?

Dr. ROPER. It is being used in a number of cities. Yes, sir.

Senator BUMPERS. And is Alaska the only place you've had significant complaints?

Dr. ROPER. That is the ones I am aware of. I heard Senator Harkin say in his statement he is aware of other cities, but I was not. I would happy to provide a followup for the record on that point.

[The information follows:]

At CDC we have heard of complaints either directly or indirectly from Missoula, MT; New York; Denver, CO; Connecticut; and Phoenix, AZ.

Senator BUMPERS. Well then, of course, the line of questioning Senator Stevens was pursuing about what might be unique about Fairbanks, AK is a very interesting one.

Dr. ROPER. It surely is. It is probably the most obvious and compelling question here.

Senator BUMPERS. Have you done, or do you plan to do any other tests in the lower 48 on this chemical?

Dr. ROPER. Yes, sir; as I was explaining earlier, what we plan to do is a further followup in Alaska, and then to replicate much the same study design in a city in the lower 48 that has MTBE, and then a third city in the lower 48 that does not have MTBE in its fuels, so that we have one in Alaska with the cold, one in the lower 48 without the cold, and one without MTBE at all.

Senator BUMPERS. And then try to mesh all of those to make your definitive conclusion?

Dr. ROPER. Yes, sir.

Senator BUMPERS. One thing that still troubles me just mildly, and this is the last question I have, Mr. Chairman, is whether refiners can use a chemical like this that has had other purposes. Obviously, everyone knew that this chemical could be used to reduce carbon monoxide levels. Under the Clean Air Act, a number of cities will want to use it if they are not already.

But my question is do refiners have the right to just add any chemical they want to it?

Dr. ROPER. No, sir; they need permission from the Environmental Protection Agency.

Senator BUMPERS. Who oversees this, EPA?

Dr. ROPER. EPA does.

Senator BUMPERS. So, EPA had signed off on the use of this chemical.

Dr. ROPER. Yes, sir; and I just would reiterate that they had, going into that decision, scientific information about what effect results from the chronic, that is prolonged exposure to very, very, very high levels of this chemical. And what they did not have, and what obviously we now wish to have, is information about exposure at much lower levels for brief periods of time. And I am not faulting their earlier decision, but just saying that we need to have more information.

Senator BUMPERS. Thank you, Mr. Chairman.

Senator HARKIN. Senator Bumpers, I was just handed this study by Drs. Moolenaar, Hefflin, and Etzel about which we are speaking. And just to refresh your memory again here, Dr. Roper, in their discussion about the gallstones, and we had talked about this with staff earlier, the doctor said: "Exposure to MTBE during gallstone dissolution has been associated with nausea, vomiting, somnolence, and the characteristic odor of MTBE on the breath, as well as intravascular hemolysis."

Dr. ROPER. Hemolysis. That is a breakdown of the blood cells.

Senator HARKIN. Duodenitis. What is that? What is duodenitis?

Dr. ROPER. Inflammation of the duodenum, a part of the bowel.

Senator HARKIN. And, in one case, renal failure.

Dr. ROPER. Yes, sir.

Senator HARKIN. No studies of long-term complications have been done. Headache, nausea, vomiting, dizziness, narcosis, respiratory failure, low blood pressure, and central nervous system depression are also reported as potential consequences of high exposure.

So, that was in the discussion. Do they still use that as a gallstone treatment? I had heard that they stopped using MTBE to treat gallstones.

Dr. ROPER. The answer is "no," it is not being use for that purpose now, as far as we know.

Senator HARKIN. Again, Dr. Roper, thank you very much, and, again, to the doctors who participated in the study. Thank you very much for conducting this study.

We look forward to, hopefully, the EPA contracting with you to get further studies done in the lower 48, as Senator Stevens refers to us down here, so that we can get a good handle on the questions. Are we looking at a unique situation here because of low temperatures? Is this widespread in other areas? Does it happen in summer, too, in other areas? Is it unique atmospheric conditions that cause this? And, of course, what is the toxicity of MTBE in the blood? We do not even know that yet.

So, we look forward to your further studies on this, and at some point down the road we will have you and your colleagues back here to discuss your further findings. Thank you.

Senator BUMPERS. One further thing before we leave, Mr. Chairman. Dr. Roper, did I understand you to say in your testimony that Governor Hickel had ordered the discontinued use of this?

Dr. ROPER. Yes, sir.

Senator BUMPERS. How is that going to affect your study?

Dr. ROPER. Well, it will mean that the results that we have already done, produced in Alaska, are likely the only results we will have from the Alaska element.

Senator BUMPERS. So, you do not need any additional information from those people you studied up there?

Dr. ROPER. As scientists, we always want more.

Senator BUMPERS. I am not suggesting that Governor Hickel order it put back in for purposes of your study, but I am just wondering what effect that would have.

Dr. ROPER. We have pre- and post-information from Alaska, and it will be very useful in comparisons to the other things.

Senator BUMPERS. Thank you.

Senator HARKIN. Thank you very much, Dr. ROPER.

Senator STEVENS. Thank you.

#### CONCLUSION OF HEARING

Senator HARKIN. The subcommittee will stand in recess subject to the call of the Chair.

[Whereupon, at 10:50 a.m., Wednesday, March 10, the hearing was concluded and the subcommittee was recessed, to reconvene subject to the call of the Chair.]









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